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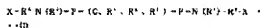
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(54) VINYL POLYMER HAVING FUNCTIONAL GROUPS AT ENDS, METHOD FOR MANUFACTURING THE SAME, AND CURABLE COMPOSITION CONTAINING THE VINYL POLYMER HAVING FUNCTIONAL GROUPS AT ENDS

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a vinyl polymer having functional groups at its ends, in which physical properties such as elongation and tensile strength attributable to chain extension are well balanced with durability such as resistance to heat and water attributable to a network structure and, furthermore, in which resins different in composition are coupled into an AB-type block polymer usable for the manufacture of a viscous adhesive, sealer, elastic adhesive, paint, foam, film, thermoplastic elastomer, damping material, various molding materials, resin modifier or the like; a method for manufacturing the same; and a curable composition containing a vinyl polymer having functional groups at its ends.

SOLUTION: The vinyl polymer having functional groups at its ends, the method for manufacturing the same, and the curable composition containing the vinyl polymer having functional groups at its ends involve formula (1), where X is -OH, -COOH, a silyl group, an alkenyl group, or an aryl group and P is a vinyl polymer whose ends connect to the end groups X through the intermediary of amine groups, etc., on both sides.



(R^3), R^5 -X (X : R^6 and R^6 among a formula) to an obtained polymer. All are the same as that of the contents of the agreement in a general formula (1). A manufacturing method of a vinyl system polymer which has a functional group at the end making an amine compound expressed react and an isocyanate compound expressed react is also the same as that of the contents of the agreement in a general formula (1).

[Claim 11] A hardenability constituent which becomes considering a vinyl system polymer which has a functional group at claims 1-8 or the end given in 9 as the main ingredients.

[Claim 12] A hardenability constituent containing a compound which contains a functional group of a vinyl system polymer which has a functional group at claims 1-8 or the end given in 9, and the above-mentioned end, and a functional group in which a reaction is possible in [two or more] a molecule.

[Claim 13] A functional group of an end of a vinyl system polymer which has a functional group at claims 1-8 or the end given in 9 is a hydroxyl group. The hardenability constituent according to claim 12 in which a compound which contains a functional group in which this and a reaction are possible in [two or more] a molecule contains at least one sort of compounds chosen from a group of a polyfunctional isocyanate compound, melamine resin, and urea resin.

[Claim 14] A functional group of an end of a vinyl system polymer which has a functional group at claims 1-8 or the end given in 9 is a carboxyl group. The hardenability constituent according to claim 12 in which a compound which contains a functional group in which this and a reaction are possible in [two or more] a molecule contains at least one sort of compounds chosen from a group of a polyfunctional isocyanate compound, a polyfunctional epoxy compound, and a polyfunctional aziridine compound.

[Claim 15] A functional group of an end of a vinyl system polymer which has a functional group at claims 1-8 or the end given in 9 is a silyl group. The hardenability constituent according to claim 12 in which a compound which contains a functional group in which this and a reaction are possible in [two or more] a molecule contains at least one sort of compounds chosen from a group of a multivalent hydroxyl compound, a multivalent hydrogen silicone compound, a multivalent alkoxysilyl compound, and silica.

[Claim 16] A hardenability constituent which has a functional group of an end of a vinyl system polymer which has a functional group at claims 1-8 or the end given in 9 is a vinyl group, and contains this and a vinyl system monomer which contains at least one polymerization nature unsaturation group in intramolecular.

[Translation done.]

substituents, and R express an aliphatic group), a heterocyclyl group, an aralkyl group, an ARARUNER group, The alkyl group of the carbon numbers 1-6 which until all replaced by the halogen atom from one of the hydrogen atom. And although either the alkyl group of the carbon numbers 1-6 replaced by 1 to three bases chosen from the group of the alkyl group of the carbon numbers 1-6, an aryl group, a heterocyclyl group, (C₆H₅)N(R¹), and (C₆H₅)N(R²) can take the hydrogen, or a glycidyl group is expressed. It is two or less places that both R¹, R² and R³ can take the hydrogen. [0019] R⁴ expresses hydrogen, an alkyl group of the carbon numbers 1-6, an alkenyl group of the carbon numbers 1-6, an aryl group, a phenyl group, or benzyl, and R⁵. Either of the alkyl groups of the carbon numbers 1-20 containing one or more polar groups or aromatic rings which were chosen from a group which consists of an ester group, an amide group, an amino group, a urethane group, a sulfinyl group, a vinyl group, and the benzene ring into an alkyl group of the carbon numbers 1-20. Its main chain, or a side chain is expressed, Y is NR⁶ or an oxygen atom, and NR⁶q². An alkyl group of the carbon numbers 1-5 or a cycloalkyl group of the carbon numbers 1-5 which both R⁶ and R⁷ combined with a nitrogen atom, Or R⁶ and R⁷ join together, and an alkylene group of the carbon numbers 2-5 is formed, A thing in which an aminal group of 3 which formed a nitrogen atom and an aminal group of 3-8 member, or has a side chain - 6 members was formed is expressed. R⁸ is an alkyl group of the carbon numbers 1-20, an alkoxyl group of the carbon numbers 1-20, an aryloxy group, or a heterocyclyl oxy group, and R⁹ expresses an alkyl group or an aryl group of hydrogen, a straight chain, or a heterocyclyl group. [0020] vinyl system polymer which has a functional group at the end of the invention according to claim 2 is expressed with a following general formula (2).

[0018]

[Formula 8]

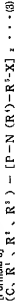


[0019] Each of X, P and R¹ - R⁵ is the same as that of the contents of the agreement in a general formula (1) among a formula, and (C, R¹, R², R³) mean having joined together in the polymer component or copolymer component expressed with P, and a carbon atom.

[0020] The vinyl system polymer which has a functional group at the end of the invention according to claim 3 is expressed with a following general formula (3).

[0021]

[Formula 9]



[0022] Each of X, P and R¹ - R⁵ is the same as that of the contents of the agreement in a general formula (1) among a formula, and Z, Ar an integer of 3-6 and (C, R¹, R², R³)-[P-N(R⁴)-R⁵-X]_n means that joined together in at least one and a carbon atom among the polymer components or copolymer components which are expressed with Z, P, and either a carbon atom, R¹, R² and R³ have combined the remaining P.]

[0023] A vinyl system polymer which has a functional group at the end of the invention according to claim 4, in a vinyl system polymer which has a functional group at the end expressed with the general formula (1) according to claim 1, (C, R¹, R², R³) are CH(R¹⁰)-Ar-CH(R¹⁰)-(Ar-R)-CH(R¹⁰) or CH(R¹⁰)-(Ar-R)-CH(R¹⁰) (among a formula). An aromatic ring in which Ar has an aromatic ring or one or more substituents, and R express an aliphatic group, and R¹⁰ and R¹¹ express an alkyl group or an aryl group of straight chain shape of the carbon numbers 1-20, or branching respectively. It is expressed.

[0024] A vinyl system polymer which has a functional group at the end of the invention according to claim 5, in a vinyl system polymer which has a functional group at the end expressed with the general formula (2) according to claim 2, (C, R¹, R², R³) are -CH(R¹⁰)-Ar-CH(R¹⁰)-(Ar-R)-CH(R¹⁰) (among a formula). An aromatic ring and R¹⁰ which have an aromatic ring or one or more substituents express an alkyl group or an aryl group of straight chain shape of the carbon numbers 1-20, or

branching. It is expressed. [0025] A vinyl system polymer which has a functional group at the end of the invention according to claim 6, in a vinyl system polymer which has a functional group at the end expressed with the general formula (3) according to claim 3, (C, R¹, R², R³) are -CH(R¹⁰)-Ar-CH(R¹⁰)-(Ar-R)-CH(R¹⁰) (among a formula). An aromatic ring and R¹⁰ which have an aromatic ring or one or more substituents, and Z, Ar an integer of 3-6, R¹¹ ..., R¹⁹ and R²⁰ express an alkyl group or an aryl group of straight chain shape of the carbon numbers 1-20, or branching respectively among a formula. It is expressed with.]

[0026] A vinyl system polymer which has a functional group at the end of the invention according to claim 7, in a general formula which expresses with claims 1-5 or an end given in 6 a vinyl system polymer which has a functional group. It is that acrylate ester (meta) of a copolymer is independent or what of a vinyl system monomer which is shown by P and in which a radical polymerization is possible is independent or that is a copolymer.

[0027] A vinyl system polymer which has a functional group at the end of the invention according to claim 8, in a general formula which expresses with claims 1-5 or an end given in 6 a vinyl system polymer which has a functional group. It is that acrylonitrile (meta) of a copolymer is independent or what of a vinyl system monomer which is shown by P and in which a radical polymerization is possible is independent or that is a copolymer.

[0028] A vinyl system polymer in which a vinyl system polymer which has a functional group at the end of the invention according to claim 9 has a functional group at claims 1-7 or the end of an invention given in 8, number average molecular weights are 500-50000, and an end functional group introduction rate is not less than 90%.

[0029] A manufacturing method of a vinyl system polymer which has a functional group at the end of the invention according to claim 10, it is a manufacturing method of a vinyl system polymer which has a functional group at claims 1-3 or the end given in 5. It is general formula NH(R¹)-R²-X to a polymer which polymerized and was produced by reacting second in a vinyl system monomer, using an iodine content compound which contains intramolecular at least one iodine atoms combined with a carbon atom of a side chain of an aromatic ring as a chain transfer agent. [Each of X, R¹, and R² is the same as that of the contents of the agreement in a general formula (1) among a formula. An amine compound expressed with] is made to react, and a functional group is introduced into a molecular terminal.

[0030] A hardenability constituent of the invention according to claim 11 becomes considering a vinyl system polymer which has a functional group at claims 1-3 or the end given in 9 as the main.

[0031] A hardenability constituent of the invention according to claim 12 contains a compound which contains a functional group of a vinyl system polymer which has a functional group at claims 1-8 or the end given in 9, and the above-mentioned end, and a functional group in which a reaction is possible in [two or more] a molecule.

[0032] A functional group of an end of a vinyl system polymer in which a hardenability constituent of the invention according to claim 13 has a functional group at claims 1-8 or the end given in 9 is a hydroxyl group. A compound which contains a functional group in which this and a reaction are possible in [two or more] a molecule contains at least one sort of compounds chosen from a group of a polyfunctional isocyanate compound, melamine resin, and urea resin.

[0033] A functional group of an end of a vinyl system polymer in which a hardenability constituent of the invention according to claim 14 has a functional group at claims 1-8 or the end given in 9 is a carboxyl group. A compound which contains a functional group in which this and a reaction are possible in [two or more] a molecule contains at least one sort of compounds chosen from a group of a polyfunctional isocyanate compound, a polyfunctional epoxy compound, and a polyfunctional aziridine compound.

[0034] A functional group of an end of a vinyl system polymer in which a hardenability constituent of the invention according to claim 15 has a functional group at claims 1-8 or the end given in 9 is a compound which contains a reaction group in which this and a reaction are possible in [two or more] a molecule contains at least one sort of compounds chosen from a group of a

the above-mentioned adhesives are applied so that the thickness after desiccation may be set to 10 micrometers. The 50-micrometer-thick OPP film was laminated on it, it was neglected for seven days at 40 °* by this state, the sample was created, and T type friction test was done by a part for speed-of-testing/of 300 mm using Instron. A test result is shown in Table 3.

[0103]Comparative example 3) The adipic acid 57g, 7 g of 4-p-tetradecyl, 36g of 1,6-hexanediol, and 0.3 g of titanium tetrachloride were weighed, a three-way neck, a stirrer, a 100-°C-capacity mouth separable flask and a refluxing separable condenser, stirring vessel, a three-way neck, a 100-°C-capacity mouth separable flask, and a condenser were added to the reaction vessel, and the reaction vessel was heated at 150 °* for 2 hours, desiccation was performed to obtain a Bore, and desiccation was performed at 270 °* for 3 hours, the copolycondensation was advanced, the polyester system polymer was obtained. It dissolved in the solvent, and adhesives were produced. Two 50-micrometer-thick OPP films were pasted up for the obtained adhesives like Example 16, the sample was created, and T type friction test was done by a part for speed-of-testing/of 300 mm using Instron. A test result is shown in Table 3.

[0107]Adhesive strength (T type friction test) was remarkable to the conventional polyester system adhesives with which the adhesives using the hardenable constituent of this invention of the above-mentioned Example 16 were shown in the comparative example 3, and it was high.

[0108](Example 17) The vinyl system polymer 50g which has a functional group at the end obtained in Example 2, The Vinyl system polymer 20g which has a functional group at the end obtained in Example 3, the vinyl system polymer 30g which has a functional group at the end obtained in Example 8, and "coronate L" 4.5g were dissolved in the partially aromatic solvent of 100 g of 200g of toluene / dimethylformamide, and adhesives were produced.

[0109]On a 50-micrometer-thick PET film, the obtained adhesives are applied so that the thickness after desiccation may be set to 10 micrometers. It dried for 10 minutes at 120 °*, and the 50-micrometer-thick PET film was laminated on it, it was neglected for seven days at 40 °* by this state, the sample was created, and T type friction test was done by a part for speed-of-testing/of 300 mm using Instron. T type friction test was similarly done as a part for resistance test about what immersed the above-mentioned sample in 80 °* JIS No. 3 oil (rubber processing oil) for 72 hours. A test result is shown in Table 4.

[0110]Comparative example 4) Two 50-micrometer-thick PET films were pasted up for the adhesives obtained by the comparative example 3 like Example 17, the sample was created, and T type friction test was done by a part for speed-of-testing/of 300 mm using Instron. A test result is shown in Table 3.

[0111]It turns out that the adhesives using the hardenable constituent of this invention of the above-mentioned Example 17 have the oil resistance outstanding to the conventional polyester system adhesives shown in the comparative example 3.

[0112](Example 18) 90 g of hydroxypropyl methacrylate, 0.2 g of acid phosphoric acid triethyl ester, 5 g of t-butyl peroxide, 0.1 g of p-benzoquinone, the hydroxyacetone 1.5g, and ABS plastics (made in *** Naugaku) "Kula Russ Chik 250A" To 30 g, the vinyl system polymer 10g which has a functional group was added to the obtained in Example 13, stirring mixing was carried out, adhesives were produced, and it applied to the general structural-steel board by brush coating. [0113]Change to the hydroxyacetone 1.5g of the above-mentioned adhesives, and adhesives are produced using 1.5 g of vanadium acetylacetone, it applied to the general structural-steel board produced from this by brush coating, it pasted together so that an adhesive application-side might paste up the steel plate of two sheets, and it was recuperated for one day at 23 °*, the sample was created, and T type friction test was done by a part for speed-of-testing/of 300 mm using Instron. A test result is shown in Table 3.

[0114]Comparative example 5) It changes to the vinyl system polymer 10g which has a functional group at the end obtained in Example 13, except having used 10 g of dimethyl formate of 18, the hydroxyacetone 1.5g of the above-mentioned adhesives, and adhesives are produced, and T type friction test was done by a part for speed-of-testing/of 300 mm using Instron. A test result is shown in Table 3.

[0115]It turns out that the adhesives using the hardenable constituent of this invention of the above-mentioned Example 18 have the adhesive strength outstanding to the conventional 2 liquid acrylic adhesives shown in the comparative example 5.

[0116]Example 19) acrylic polyol (the Dainippon Ink chemicals company make and "AKURIDIKU DI-1573" 95% of solid content [150 g of], the titanium dioxide 100g, 8.0 g of dihydroxyethane 100g, in 0.3g of dibutyltin dilaurate, and 300 g of toluene, the vinyl system polymer 50g which has a functional group was added to the end obtained in Example 6, stirring mixing was carried out, and the hardenable constituent (acrylic urethane paint) was produced.

[0117]On the OPP film with a thickness of 75 micrometers which carried out corona discharge treatment of above-mentioned hardenable constituent (acrylic urethane paint) applied so that the thickness after desiccation may be set to 25 micrometers, and it dried for 20 minutes at 150 °*, and the coat was formed. In order to evaluate the performance of the above-mentioned hardenable constituent, the break with a size of 10 mm x 10 mm in a grid pattern was put in in all directions [of the coat], 100 masses were made, the cross out adhesion test which sticks and tears off a collophane tape on this mass was done, and the number of masses of the coat which separated was measured. After folding up the OPP film painted [above-mentioned], at the angle of 180 degrees, the bending test which develops this in the original state was done, and it examined visually whether the white black mark and the crack occurred on the fold of the coat, and it examined visually whether the white black neither a white black mark nor a crack is accepted, and things** which the white black mark and the crack generated. The result was shown in Table 4.

[0118](Example 20) The isle of the hardenable constituent (acrylic urethane paint) of Example 19, Decrease the quantity of the loadings of acrylic polyol from 150g to 100 g, and it changes to the vinyl system polymer 50g which has a functional group at the end obtained in Example 6. Except having used the vinyl system polymer 100g which has a functional group for the end obtained in Example 7, the hardenable constituent (acrylic urethane paint) was produced like Example 19, and the performance was evaluated similarly. The result was shown in Table 4.

[0119]Comparative example 6) The isle of the hardenable constituent (acrylic urethane paint) of Example 19, The quantity of the loadings of acrylic polyol was increased from 150g to 200 g, and except not having blended the vinyl system polymer which has a functional group at the end of this invention, the hardenable constituent (urethane paint) was produced like Example 19, and the performance was evaluated similarly. The result was shown in Table 4.

Table 4

用 意 材	実 験 例 1			実 験 例 2			実 験 例 3			実 験 例 4			実 験 例 5		
	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30
アクリルポリオール (100%純度)	0	0	3.5	—	—	—	—	—	—	—	—	—	—	—	—
官能基数 (mol/l)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
官能基数 (mol/l)	—	—	—	250	230	220	110	2	1	1	1	1	1	1	1
官能基数 (mol/l)	—	—	—	630	570	550	750	550	530	530	530	530	530	530	530
官能基数 (mol/l)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

[0121]It turns out that the acrylic urethane paint using the hardenable constituent of this invention of Example 19 and Example 20 has the performance which was extremely excellent in both the adhesive property of a coat, and bendability-proof as compared with the conventional acrylic urethane paint of the comparative example 6 which did not use this so that more clearly than Table 4

[0122](Example 21) To the vinyl system polymer 25g which has a functional group at the end obtained in the vinyl system polymer 75g and Example 5 which have a functional group at the end obtained in Example 3, 2.5g of isophorone diisocyanate and 0.5 g of dibutyltin dilaurate were added, by Plast Mill, kneading mixing was carried out for 20 minutes, and 200 % of thermoplastic poly block copolymers were produced.

[0123]The 1-mm-thick sheet was produced using the pressing machine, and a physical-properties

examination (at the time of a fracture tensile fracture strength, elongation) and weathering test (scratch retention). The above data were presented with the above-mentioned thermoplastic poly block copolymer. A physical-properties examination was done based on JIS K 8301, using the sunshine weatherometer, under the environment of 50 °C and 65%RH, UV radiation of the weathering test was carried out, and it was done. The test result was shown in Table 4.

[0124]Example 22) The vinyl system polymer 50g which has a functional group at the end obtained in Example 8, The vinyl system polymer 10g and 0.5 g of diisobutyl diluent which has a functional group at the end and obtained in Example 9, Decompression of the inside of the above-mentioned polymerization vessel to 5 Torr, after adding a stirrer, the vinyl system polymer 50g, the diisobutyl diluent 0.5g, and a three-necked flask, a thermometer, a magnetic stirrer, a thermometer, a thermometer probe, heating stirring, a performed at 200 °C for 3 hours, the polymerization was advanced, and the thermoplastic poly block copolymer was produced. About the obtained thermoplastic poly block copolymer, a physical-properties examination and weathering test of a normal state were done like Example 21. The test result was shown in Table 4.

[0125]Comparative example 7) 50 g of naphthalene-*dicarboxylic acid dimethyl*, the adipic acid 30g, After sealing 50g of ethylene glycol, and 0.5 g of titanium tetra isopropoxide POKISADO to four 1-liter-capacity mouth separable flask and attaching separable covering, stirring vials, a three-way cock, and a thermometer probe, the inside of the above-mentioned polymerization vessel was stirred at 200 °C for 1 hour. Subsequently, decompressing to 5 Torr, heating stirring was performed at 270 °C for 3 hours, the polymerization was advanced, and the thermoplastic poly block copolymer was produced. About the obtained thermoplastic poly block copolymer, a physical-properties examination and weathering test of a normal state were done like Example 21. The test result was shown in Table 4.

[0126]Comparative example 8) About the thermoplastic elastomer which consists of styrene butadiene styrene block copolymer (SBS, 35 % of the weight of styrene content), a physical-properties examination and weathering test of a normal state were done like Example 21. The test result was shown in Table 4.

[0127]The acrylic thermoplastic elastomer using the hardenability constituent of this invention of Example 21 and Example 22 so that more clearly than Table 4, it turns out that it has outstanding physical properties and especially outstanding weatherproof performance of a normal state. The comparative example 8 which did not use this.

[0128]Example 23) The vinyl system polymer 100g which has a functional group at the end obtained in Example 11. Knocking mixing of the calcium carbonate 70g, the titanium dioxide 30g, and 0.5 g of the diisobutyl diluent was carried out by Plast Mill for 1 hour, and care-of health SI and a sealing agent were produced for three days under the environment of 23 °C and 55%RH. About the obtained sealing agent, a physical-properties examination and weathering test of a normal state were done like Example 21. The test result was shown in Table 4.

[0129]Comparative example 9) It changed to the vinyl system polymer 100g which has a functional group at the end obtained in Example 11 of Example 23, and the sealing agent was produced like Example 23 except having used 100 g of polypropylene glycole of both-ends alkoxy silyl groups. About the obtained sealing agent, a physical-properties examination and weathering test of a normal state were done like Example 21. The test result was shown in Table 4.

[0130]Comparative example 10) Both-ends hydroxy group polypropylene glycol [Mn=10000, hydroxy value (KOH/g) $\times 10^{-1}$] Carry out stirring of the 100 g at 100 °C under decompression of 5 Torr, and diisobutyl diluent is added so that it may be set to incorporate group of hydroxy group (mole ratio) 1:1.2 to this; it was made to react at 80 °C for 3 hours, and moisture curing type polypropylene-glycol polypropylene glycol of the both-ends isocyanate group was produced.

[0131]It changed to the vinyl system polymer 100g which has a functional group at the end obtained in Example 11 of Example 23, and the sealing agent was produced like Example 23 except having used 100 g of moisture curing type polypropylene glycole of the above-mentioned both-ends isocyanate group. About the obtained sealing agent, a physical-properties examination and weathering test of a normal state were done like Example 21. The test result was shown in Table 4.

[0132]It turns out that the sealing agent using the hardenability constituent of this invention of Example 23 has the outstanding physical properties and especially outstanding weatherproof

performance of a normal state as compared with the conventional sealing agent of the comparative example 8. The test result was shown in Table 4.

[0133]Example 24) 100g of toluene, and the silica (the product made by Japanese Aerosol) With a homogenizer, stir-Aerosol 200[®], and the 30-mm mean particle diameter of 5.0 g for 1 hour, and they were distributed. After adding the toluene solution and 0.2 g of diisobutyl diluent of this vinyl system polymer 50g, after sealing a three-necked flask, a thermometer, a thermometer probe, heating stirring, a performed at 80 °C for 2 hours, the polymerization was advanced, and the thermoplastic poly block copolymer was produced. About the obtained thermoplastic poly block copolymer, a physical-properties examination and weathering test of a normal state were done like Example 21. The test result was shown in Table 4.

[0134]It has a flowing-back condenser tube and agitating blades, and 3.0 g of obtained refining silica was added to the 500-ml flask by which the nitrogen purge was carried out, and it was made to stir and distribute it with 50g of toluene, and 50 g of methyl methacrylate (MMA). After having added 0.1 g of azobisisobutyronitrile (azobisisobutyronitrile) to these dispersion liquid, carrying out bubbling with nitrogen gas and removing the dissolved oxygen in a system, it was made to polymerize at 80 °C for 8 hours, and silica restoration poly(methylmethacrylate) (PMMA) was produced.

[0135]On the PRT film by which releasing treatment was carried out, the obtained PMMA toluene solution was applied so that the thickness after desiccation might be set to 10 micrometers, and it dried for 10 minutes at 110 °C, and the silica restoration PMMA film was produced. It was 80% when the total light transmittance of the obtained silica restoration PMMA film was measured. [0136]Comparative example 11) On the occasion of silica restoration PMMA production of Example 24, it changed to the vinyl system polymer 3.0g which has a functional group at the end obtained in Example 12. Except having produced surface treatment silica using 2.0 g of octyl trimethoxysilane, silica restoration PMMA was polymerized like Example 24, and the silica restoration PMMA film was produced. When the total light transmittance of the obtained silica restoration PMMA film was measured, as compared with the silica restoration PMMA film using the vinyl system polymer which has a functional group at 78% and the end of this invention, it was remarkable and the optical restoration was low.

[0137]Effect of the Invention) The vinyl system polymer which has a functional group at the end of the invention according to claim 1. Since it is constituted as mentioned above, by the chain extension not only by reticulating-tizing by bridge construction but an end functional group. Resin excellent in elongation or tensile strength is obtained, and it is used suitably for an adhesive, sealing agent, adhesives, paint, foam, film, thermoplastic-elastomer, sound deadener, various molding material, and gel coat agent, artificial marble, etc. The vinyl system polymer which has a functional group at the end of this invention, it originates in the amide group which exists in the end of a polymers chain, chain extension and the reaction of hardening become certain and easy, and such reaction time is shortened, and let the workability and workability of fabrication operation or construction construction using the molding material and hardenability constituent containing these be a very good thing.

[0138]The vinyl system polymer which has a functional group at the end of the invention according to claim 2. Since it is constituted as mentioned above, the vinyl system polymer which does so the chain extension effect by the end functional group described above, and has a functional group especially in one end. Can do so the remarkable function which is not obtained with the conventional low-molecular-weight type as the resin modifier which used the functional group for the end, or a surface-active agent, and by coupling of the resin of a different presentation further. The so-called block polymer of an AS type can be compounded, and it can use effectively as a resin modifier or a block copolymer in a similar manner. [0139]The vinyl system polymer which has a functional group at the end of the invention according to claim 3. Since it is constituted as mentioned above, can do so the effect indicated in front 2. Paragraph, and by the chain extension by an end functional group as what is called star shape polymer. The outstanding resin which the superfluous increase in crosslinking density was controlled and balance was able to take is obtained, and it is used suitably for an adhesive, sealing agent, elastoc adhesives, paint, foam, film, thermoplastic-elastomer, sound deadener, various molding material, and gel coat agent, artificial marble, etc.

[0140]Since the vinyl system polymer which has a functional group at the end of the invention

according to claim 4 is constituted as mentioned above, it makes remarkable outstanding performance described above among the vinyl system polymer which has a functional group at the end of the invention according to claim 1.

[0141] Since the vinyl system polymer which has a functional group at the end of the invention according to claim 5 is constituted as mentioned above, it makes remarkable outstanding performance described above among the vinyl system polymer which has a functional group at the end of the invention according to claim 2.

[0142] Since the vinyl system polymer which has a functional group at the end of the invention according to claim 6 is constituted as mentioned above, it makes remarkable outstanding performance described above among the vinyl system polymer which has a functional group at the end of the invention according to claim 3.

[0143] Since the vinyl system polymer which has a functional group at the end of the invention according to claim 7 is constituted as mentioned above, it makes the high radical polymerization of the vinyl system polymer which has a functional group at the end of the invention according to claim 1 to 6, flexible possible, and makes remarkable outstanding performance described above among the vinyl system polymer which has a functional group at the end of the invention according to claim 1 to 6. [0144] Since the vinyl system polymer which has a functional group at the end of the invention according to claim 8 is constituted as mentioned above, it makes the high radical polymerization of the vinyl system polymer which has a functional group at the end of the invention according to claim 1 to 6, flexible possible, and makes remarkable outstanding performance described above among the vinyl system polymer which has a functional group at the end of the invention according to claim 1 to 6. [0145] Since the vinyl system polymer which has a functional group at the end of the invention according to claim 9 is constituted as mentioned above, it is excellent in hardening performance and makes remarkable outstanding performance described above among the vinyl system polymer which has a functional group at the end of the invention according to claim 1 to 8.

[0146] The manufacturing method of the vinyl system polymer which has a functional group at the end of the invention according to claim 10, for radical stabilization according to [] since it is constituted as mentioned above, radical dissociation of a carbon-halogen bond takes place easily, and [] to the pi electron of an aromatic ring. The chain transfer nature of the generated carbon radical is high, control of a reaction becomes easy and each vinyl system polymer which has a functional group at the end of the invention shows the performance which was excellent so that it might describe above.

[0147] Since the hardenability constituent of the invention according to claim 11 is constituted as mentioned above, it shows the performance which hardened fast and was excellent in many uses mentioned above.

[0148] Since the hardenability constituent of the invention according to claim 12 is constituted as mentioned above, it shows the performance outstanding in many uses which constitute and describe a hardenability constituent above combining a cross linking agent or a chain elongation agent.

[0149] Since the hardenability constituent of the invention according to claim 13 is constituted as mentioned above, it shows the performance outstanding in many uses which constitute and describe a hardenability constituent above combining the cross linking agent or chain elongation agent described above.

[0150] Since the hardenability constituent of the invention according to claim 14 is constituted as mentioned above, it shows the performance outstanding in many uses which constitute and describe a hardenability constituent above combining the cross linking agent or chain elongation agent described above.

[0151] Since the hardenability constituent of the invention according to claim 15 is constituted as mentioned above, it shows the performance outstanding in many uses which constitute and describe a hardenability constituent above combining the cross linking agent or chain elongation agent described above.

[0152] Since the hardenability constituent of the invention according to claim 16 is constituted as mentioned above, it shows the performance outstanding in many uses which constitute and describe a hardenability constituent above combining the cross linking agent or chain elongation agent described above.

[Translation done.]